A VALVE AND A DISPENSER DEVICE INCLUDING SUCH A VALVE

The present invention relates to a valve and to a fluid dispenser device including such a valve. More particularly, the present invention applies to metering valves in particular.

Such valves are well known in the prior art. They generally comprise a valve body in which a valve member slides between a rest position and a dispensing position in which the valve member is generally axially driven into the valve body. The valve member slides relative to the valve body with one or more sealing gaskets interposed therebetween, so as to guarantee that the fluid is dispensed safely and reliably. A problem that can exist with such valves relates to the risk of leakage during actuation, and thus to the fluid being improperly dispensed. By way of example, this can occur when the user who actuates the valve exerts a force that is not exactly axial on the valve member. This can result in the valve member being displaced a little relative to its central axis, thereby running the risk of leaks occurring at the junction between the sealing gaskets and said valve member. This is particularly problematic when the valve is a metering valve, i.e. a valve including a metering chamber that defines a precise quantity or "dose" of fluid that is to be dispensed each time the valve is actuated. In particular, for pharmaceuticals, inaccuracy or non-reproducibility of the metered dose can be harmful to the user. Another problem that exists, in particular in metering valves, relates to the accuracy and to the reproducibility of the metered dose, even when the device stored between two valve actuations. In general, metering valves include a filler channel that makes it possible to fill the metering chamber once a dose has been dispensed, while the valve member is returning from its dispensing position to its rest position. Such filling takes place by gravity when the valve is used upsidedown and/or by suction resulting from

the preceding dose being dispensed. When the valve is stored upright, there is thus a risk of the fluid flowing back through the filler channel into the reservoir, thereby reducing the quantity contained in the metering chamber, and thus spoiling the accuracy and the reproducibility of the metered dose. Once again, for pharmaceuticals, this can have serious consequences for the user.

An object of the present invention is to provide a fluid dispenser valve, in particular a metering valve, that does not have the above-mentioned drawbacks. More particularly, an object of the present invention is to provide such a valve that guarantees good accuracy and reproducibility of the metered dose each time the valve is actuated.

Another object of the present invention is to provide such a valve that guarantees safe and reliable operation of said valve even when the user exerts a force that is not completely axial on the valve member.

Another object of the present invention is to provide such a valve that is simple and inexpensive to manufacture and to assemble.

The present invention thus provides a fluid dispenser valve comprising a valve body and a valve member that is slidable in said valve body between a rest position and a dispensing position, said valve member including a dispenser orifice, said valve including an axial guide element that co-operates with a guided portion of the valve member, said guided portion being remote from said dispenser orifice.

Advantageously, said guide element is secured to said valve body, in particular by being made integrally therewith.

Advantageously, said guide element is a hollow sleeve having an inside diameter that is approximately equal to the outside diameter of the guided portion of the valve member that is slidable in said hollow sleeve.

In a first embodiment, said hollow sleeve has a blind hollow.

In a second embodiment, said hollow sleeve has a through hollow.

Advantageously, said valve is a metering valve including a metering chamber, said valve member including a dispenser channel connecting the metering chamber to said dispenser orifice when the valve member is in its dispensing position, and a filler channel for filling said metering chamber when the valve member returns to its rest position.

Advantageously, said valve member comprises a top portion including the dispenser orifice, and a bottom portion including said guided portion, said top and bottom portions being assembled one in the other so as to define said filler channel.

The bottom portion of the valve member advantageously includes a blind hole including two lateral through orifices, with one orifice opening out into the metering chamber when the valve member is in its rest position, the top portion of the valve member being fitted in said blind hole so as to close said blind hole axially.

In a first embodiment, the blind hole of the bottom portion of the valve member forms a central axial channel that is connected to said two lateral orifices, thereby forming said filler channel, the bottom end of said top portion of the valve member axially defining said central channel.

Advantageously, said central channel has a cross-section that is polygonal, and in particular triangular.

In a second embodiment, the top portion of the valve member includes a groove that extends axially and that co-operates with said blind hole of said bottom portion of the valve member to define at least one portion of the filler channel.

Advantageously, at least one of said lateral orifices is conical in part, tapering towards the blind hole.

The minimum diameter of said at least one conical orifice is advantageously about 0.3 millimeters (mm).

The present invention also provides a fluid dispenser device including a valve as described above.

Other characteristics and advantages of the present invention appear more clearly from the following detailed description of a plurality of embodiments thereof, given by way of non-limiting example, and with reference to the accompanying drawings, and in which:

- Figure 1 is a diagrammatic section view of a valve constituting a first embodiment of the present invention;
- Figure 2 is a view similar to the view in Figure 1, showing another embodiment of the present invention;
- Figure 3 is a section view on section line CC in Figure 2;
- Figure 4 is a section view on section line BB in Figure 2;
- Figure 5 is a view similar to Figures 1 and 2, showing another embodiment of the present invention;
- Figure 6 is a larger-scale view of a detail A in Figure 5;
- Figure 7 is a section view on section line BB in Figure 5; and
- Figure 8 is a section view on section line CC in Figure 5.

With reference to the figures, the valve comprises a valve body 10 in which a valve member 20 slides between a rest position (shown in Figures 1, 2, and 5) and a dispensing position (not shown), in which the valve member is axially driven into the valve body 10.

The valve member 20 includes a dispenser orifice 25, and, in a first aspect of the present invention, a portion 29 that is remote from said dispenser orifice 25.

In the invention, the portion 29 co-operates with an axial guide element 15, such that the valve member 20 is always displaced exactly in alignment with the central axis X of the valve. The guided portion 29 of the valve member 20 that co-operates with the guide element 15 is advantageously formed by the end of the valve member 20 that is remote from the dispenser orifice 25, so as to ensure good axial guidance. The axial guide element 15 is preferably secured to said valve body 10, in particular by being made integrally therewith, as shown in Figures 1, 2, and 5. The guide element 15 can advantageously be made in the form of a hollow sleeve having an inside diameter that is approximately equal to the outside diameter of the guided portion 29 of the valve member 20 sliding in said hollow sleeve. As shown in Figures 2 and 3, one or more fluid-flow grooves 16 can optionally be provided in said guide element 15, so as to enable fluid to flow from the reservoir (not shown) to the inside of the valve body 10, about said guided portion 29 of the valve member. Advantageously, said at least one groove also makes it possible to avoid any risk of the valve member and the valve body seizing as a result of active substances possibly becoming deposited on one of said portions. In a variant, as shown diagrammatically in Figure 1, the passage for the fluid can be made in a side wall of the valve body 10. With this configuration, the hollow sleeve 15 forming the guide element can have a blind hollow, as shown in Figure 1. Another variant, shown in Figures 2 and 5, shows a sleeve 15 having a through hollow, with the valve member optionally being able to project out from the valve body 10 into the reservoir (not shown) when the valve member 20 is driven into its dispensing position. As shown clearly in particular in the section view in Figure 3, even if the user exerts a force that is not exactly parallel to the central axis X, the valve member cannot deviate while it is being displaced along said

axis X because of the guide element 15 that axially guides the displacement of the guided portion 29 of the valve member, and thus of the entire valve member. Any risk of off-setting the valve member during actuation is thus avoided, and therefore any risk of leakage is avoided, in particular at the top gasket of the valve.

In an advantageous embodiment of the invention, the valve is a metering valve, i.e. including a metering chamber 30. The valve member 20 advantageously includes a dispenser channel 24 that connects the metering chamber 30 to the dispenser orifice 25 when the valve member is in its dispensing position. In addition, a filler channel 26 is advantageously provided for filling the metering chamber 30 while the valve member is returning from its dispensing position to its rest position. In particular, when the valve is used upsidedown, but is stored upright, a problem may exist of retaining the dose in the metering chamber 30 between two actuations of the valve. In order to eliminate this problem, the present invention envisages decreasing the section of the filler channel 26 as much as possible, so as to prevent the fluid contained in the metering chamber from flowing back to the reservoir through said channel.

Figures 1, 2, and 4 show a first embodiment. In this first embodiment, the valve member 20 comprises a top portion 21 that incorporates the dispenser orifice 25, and a bottom portion 22 that incorporates the guided portion 29. The top and bottom portions 21, 22 are assembled one in the other, preferably in leaktight manner, so as to define the filler channel 26, at least in part. In the embodiment in Figures 1, 2, and 4, the bottom portion 22 of the valve member 20 includes a blind hole 23 that includes two lateral through orifices 27, 28, with one orifice opening out into the metering chamber 30 when the valve member 20 is in its rest position, and the other orifice opening out outside the metering chamber 30 in a portion that is connected to the

reservoir. In this first variant, the blind hole 23 of the bottom portion 22 of the valve member forms a central axial channel 23 that is connected to said two lateral orifices 27 and 28, said central channel 23 and said lateral orifices 27 and 28 thereby forming said filler channel 26. The top portion 21 of the valve member 20 is preferably fitted in the blind hole 23, so as to close said blind hole 23 axially, and thus axially define said filler channel 26 in this first variant. The central channel 23 advantageously has a cross-section that is polygonal, and preferably triangular, as shown in Figure 4. This makes it possible to increase the contact area between the fluid and the channel, while decreasing the section of said channel, so as to limit, or indeed prevent, the fluid from flowing back through said channel when the valve is stored upright. In order to improve this retention still further, at least one, and preferably both of said lateral orifices 27, 28 is/are conical in part, and preferably in full, as shown in Figures 1 and 2, tapering towards the inside of the central channel 23. Advantageously, the minimum diameter of the conical orifice(s) is about 0.3 mm. With such a diameter, it is practically impossible for the fluid contained in the metering chamber 30 to flow back through the filler channel 26, the diameter being too small to enable the fluid to pass merely by gravity. The conical shape of the holes makes it possible to make the minimum diameter of said holes with a very low value of about 0.3 mm. Cylindrical pins for molding cylindrical holes of such a size would be too fragile, such that it would be very difficult and costly to make cylindrical through holes of dimension of about 0.3 mm in diameter. However, by providing conical holes that taper towards the inside of the channel 23, the desired result is obtained, namely retaining the dose in the metering chamber 30 while making it possible to mold and form the holes in simple and inexpensive manner by means of very strong conical

pins having only one end that includes a small dimension of about 0.3 mm.

Figures 5 to 8 show another embodiment of the present invention, in which the filler channel 26 is defined, in part, by a groove 23' provided in the top portion 21 of the valve member, and co-operating with said blind hole 23 to define the filler channel 26, at least in part. This embodiment makes it possible to make a filler channel having dimensions that are even smaller than in the first embodiment, and that thus retain the dose even more securely in the metering chamber 30. In this embodiment, as shown in Figures 5, 6, and 7, the through holes 27 and 28 can be conical in part only, and they could even be completely cylindrical, with greater dimensions, the retention thus being provided not mainly by the holes, but by the very small section of the filler channel 26 at said groove 23'. Once again, it is by fitting the top portion 21 of the valve member in the bottom portion 22 of said valve member that a filler channel is formed, providing good retention, even during long-term storage. Naturally, the shape and the dimensions of the groove 23', as shown in Figures 7 and 8, could be modified according to requirements, in particular so as to ensure good filling of the metering chamber, while avoiding any loss of dose by providing complete retention of the dose when it is in the metering chamber 30. Filling can take place in spite of the very small section of the groove 23', in particular because, when the valve member 20 is returned from its dispensing position to its rest position by the return spring 50, the valve is generally upsidedown, and filling takes place not only by gravity, but also by suction created inside said metering chamber during dispensing of the preceding dose.

Naturally, by combining a filler channel 26 that provides good retention of the dose in the metering chamber 30, with guide means 15 for guiding the valve

member 20 and ensuring that said valve member is displaced in accurately axial manner, reproducibility and good accuracy for the metered dose are guaranteed each time the valve is actuated. However, it should be understood that these aspects could be provided separately from each other as a function of requirements.

Although the invention is described above with reference to a plurality of embodiments, it is clear that it is not limited by the embodiments shown. On the contrary, any useful modifications can be applied thereto by the person skilled in the art, without going beyond the ambit of the present invention, as defined by the accompanying claims.